TITLE

ON-BOARD ANOMALY TROUBLESHOOTING/COORDINATION FOR STATION SYSTEMS, NON-DATA PLSS, POIF-OPERATED EQUIPMENT AND PAYLOADS

PURPOSE

To define procedures for identifying, analyzing, and assessing anomalies affecting payload operations.

PARTICIPATION

POD	PRO	OFD	PAYCOM
OC	PSE	Users	POIC Cadre
LIS Rep	SCM	POM	

EFFECTIVITY

Increment 2 and subsequent

REFERENCE DOCUMENTATION

NASA Payload Regulation (SSP 58313), N3.1-1

Multilateral Payload Regulation (SSP 58002), M3.1-1 and M3.1-2

Joint Operations Interface Procedures (JSC 2817936366), Volume B (RSAMCC-M/MCC_H)

Joint Operations Interface Procedures (JSC 28179), Volume C (SSCCMCC-H/POIC)
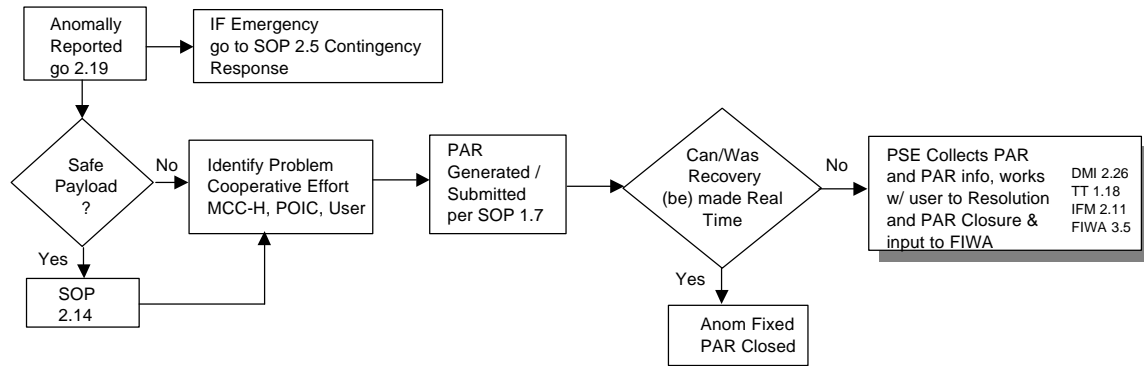
POH Vol 2:

GENERAL

All payload, LSE, and PLSS interface anomalies must be documented in the Payload Anomaly Log (PAL). All ISS system anomalies will be documented in the ISS Systems Anomaly Log, and resolution will be led by MCC-H. OC will lead all resolutions for payload anomalies and/or payload affected anomalies. If an anomaly affects safety, SCM will be requested to review and make comments. POD will be kept abreast of all anomaly resolution activities.

In an anomaly situation, the following steps will be taken: (1) Inform POD of the impact and extent of the anomaly; (2) Perform safing of payloads as necessary; (3) Determine the cause of the anomaly; (4) Formulate a recovery plan; (5) Execute the recovery plan per POD approval. Some of the steps may be skipped and/or combined depending on the nature of the anomaly. Anomaly identification is a cooperative effort between MCC-H, POIC, PCC, and the Users. It is also important to note that an anomaly does not necessarily mean safing of payloads is required. ~~Anomaly l~~Logic flow for realtime anomaly response and the investigation and recovery of an anomaly is depicted in Figure 2.19-1.
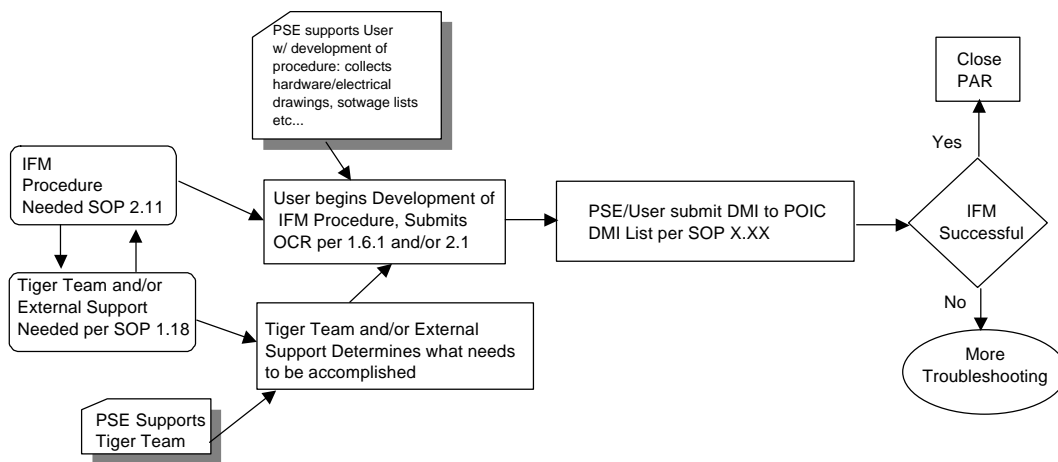
GROUNDRULES

1. If the anomaly is considered a major contingency, follow SOP 2.5 Contingency Response instead of this procedure. A major contingency is defined as an incident or accident that threatens or causes crew injury, vehicle damage or damage to a major payload or facility and will trigger a formal investigation.

~~1.~~2. Troubleshooting and recovery plans must be performed using resources that have been allocated for that equipment; either pre-allocated before the anomaly or specifically requested via OCR for the troubleshooting/recovery.

~~2.~~3. All anomalies will be recorded in the appropriate anomaly log per SOP 1.7..

~~3.~~4. If safing is required, use POH SOP 2.14.

~~4.~~5. Non-data PLSS is defined as the EPS, TCS, and the ECLSS.

~~5.~~6. POIF-operated hardware is defined as the EXPRESS Racks, EXPRESS Pallet, Window Observation Research Facility (WORF), and Minus Eighty degrees Laboratory Freezer for International Space Station (MELFI).

NOTE: These procedures may be limited by the anomaly itself. Also, safing is not the same as safety. Safing is an attempt to protect hardware from permanent damage. Safety involves crew welfare.

Anomaly Reported go 2.19 → IF Emergency go to SOP 2.5 Contingency Response

Safe Payload ? — No → Identify Problem Cooperative Effort MCC-H, POIC, User → PAR Generated / Submitted per SOP 1.7 → Can/Was Recovery (be) made Real Time — No → PSE Collects PAR and PAR info, works w/ user to Resolution and PAR Closure & input to FIWA   DMI 2.26 TT 1.18 IFM 2.11 FIWA 3.5

Yes ↓ SOP 2.14

Can/Was Recovery (be) made Real Time — Yes → Anom Fixed PAR Closed

Real-Time Anomaly Response

PSE supports User w/ development of procedure: collects hardware/electrical drawings, sotwage lists etc...

IFM Procedure Needed SOP 2.11 → User begins Development of IFM Procedure, Submits OCR per 1.6.1 and/or 2.1 → PSE/User submit DMI to POIC DMI List per SOP X.XX → IFM Successful

Tiger Team and/or External Support Needed per SOP 1.18 → Tiger Team and/or External Support Determines what needs to be accomplished

PSE Supports Tiger Team

IFM Successful — Yes → Close PAR

IFM Successful — No → More Troubleshooting

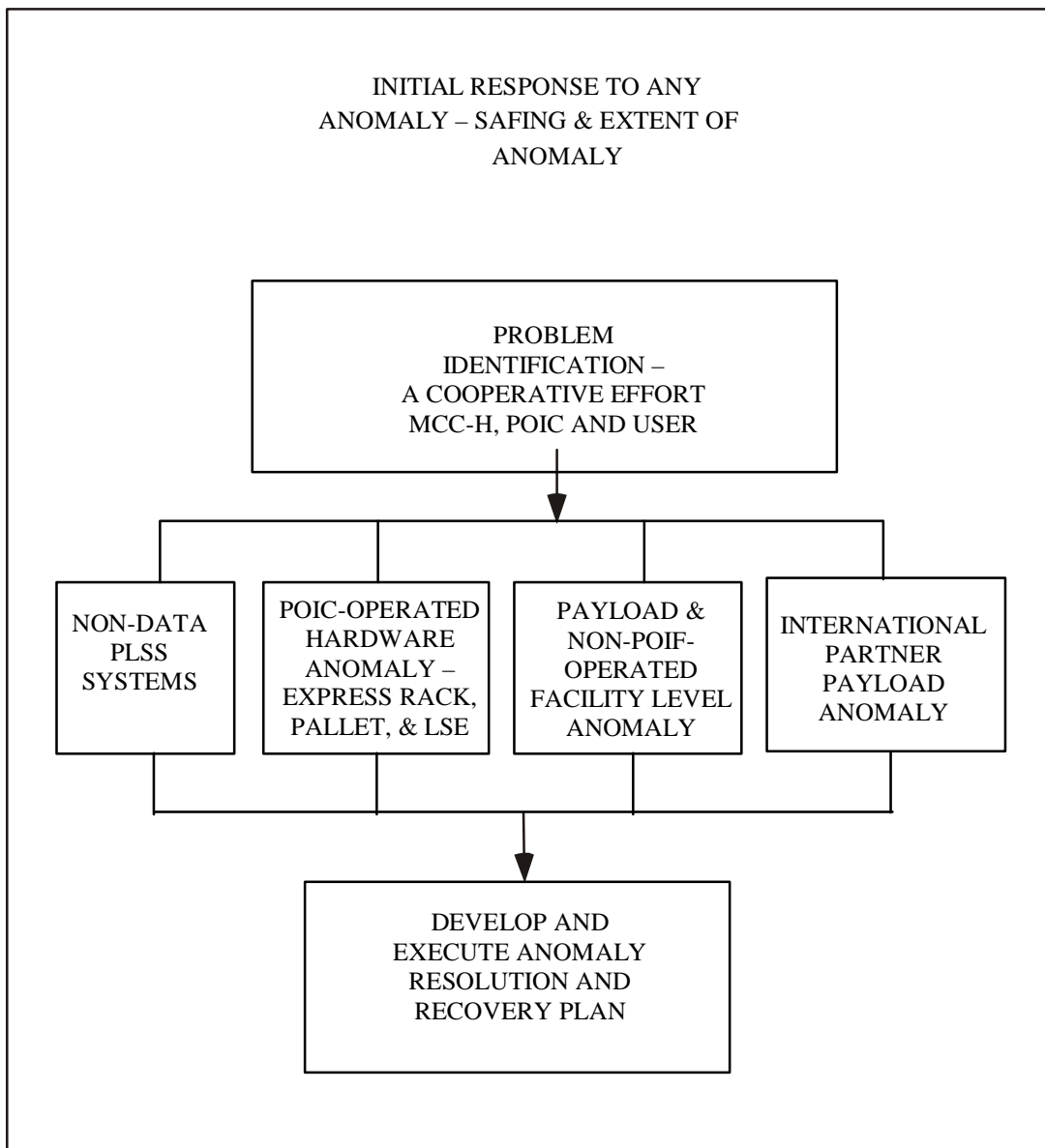**Anomaly Investigation and Recovery**

FIGURE 2.19-1 ANOMALY LOGIC FLOW DIAGRAM

PROCEDURE

A. Initial Anomaly Response

1. User/Facility operator/cadre/crew/MCC-H/PCC identifies that an anomaly has occurred. Cadre is notified on the POD loop that an anomaly has occurred.

2. Cadre is notified on the POD loop that an anomaly has occurred.

2.3. Dependent upon nature of anomaly and crew activity, PAYCOM informs crew, via voice or crew message, of anomaly occurrence and status. Additional status reports will be provided as necessary.

3.4. User/Facility operator/cadre/crew/MCC-H/PCC attempt to determine the size and nature of the anomaly.

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│                    INITIAL RESPONSE TO ANY                        │
│                 ANOMALY – SAFING & EXTENT OF                      │
│                          ANOMALY                                  │
│                                                                   │
│                  ┌─────────────────────────┐                      │
│                  │        PROBLEM          │                      │
│                  │    IDENTIFICATION –     │                      │
│                  │  A COOPERATIVE EFFORT   │                      │
│                  │  MCC-H, POIC AND USER   │                      │
│                  └─────────────────────────┘                      │
│                                                                   │
│   ┌──────────┐  ┌──────────────┐  ┌──────────────┐  ┌──────────┐ │
│   │NON-DATA  │  │POIC-OPERATED │  │ PAYLOAD &    │  │INTERNAT- │ │
│   │PLSS      │  │HARDWARE      │  │ NON-POIF-    │  │IONAL     │ │
│   │SYSTEMS   │  │ANOMALY –     │  │ OPERATED     │  │PARTNER   │ │
│   │          │  │EXPRESS RACK, │  │FACILITY LEVEL│  │PAYLOAD   │ │
│   │          │  │PALLET, & LSE │  │ ANOMALY      │  │ANOMALY   │ │
│   └──────────┘  └──────────────┘  └──────────────┘  └──────────┘ │
│                                                                   │
│                  ┌─────────────────────────┐                      │
│                  │      DEVELOP AND         │                     │
│                  │  EXECUTE ANOMALY         │                     │
│                  │  RESOLUTION AND          │                     │
│                  │  RECOVERY PLAN           │                     │
│                  └─────────────────────────┘                      │
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FIGURE 2.19-1 ANOMALY LOGIC FLOW DIAGRAM

4.5.   If safing is required, perform SOP 2.14.

5.6.   Responsible party prepares and submits PAR in accordance with SOP 1.7.

6.7.   User/Facility operator/cadre/crew/MCC-H/PCC attempt to determine the full extent
       of the anomaly and assess impacts. OC leads anomaly resolution with guidance from
       SCM. The anomaly should fall into one or more of the following areas:

       (a) If ISS Non-Data PLSS Systems, go to Section B.
       (b) If POIC-Operated Hardware Anomaly, go to Section C.

(c) If Payload and Non-POIC-Operated Facility Anomaly, go to Section D.

(d) If International Partner Payload Anomaly, go to Section E.

B. ISS Non-Data PLSS System Level

JOIP NOTE: MCC-H will lead further troubleshooting of the affected ISS resources. PRO/Users assist MCC-H if possible to determine anomaly signature. Refer to the appropriate JOIP section.

1. PRO coordinates with OC and POD on the POD loop about impacts to other payload facilities.

2. LIS Rep provides OC science priorities if needed.

3. Once ISS PLSS resources have been recovered, ~~Facility operator~~User/PRO coordinates with OC~~/Users~~ to formulate a payload recovery plan.

    (a) If resources are currently scheduled, ~~Facility operator~~User/OC gets payload recovery plan approved by the POD.

    (b) If resources are not currently scheduled, ~~the Facility operator~~User submits an OCR per SOP 1.6 to schedule resources for the payload recovery plan.

4. When the OCR is approved, ~~and~~ resources are ~~currently~~ scheduled, and the recovery plan has been approved, the ~~Facility operator/~~cadre/~~U~~users support the payload recovery plan and actions as defined on the OCR.

5. OC notifies POD of the results of the recovery effort.

6. PAYCOM informs crew of the results of the recovery effort.

7. Upon successful recovery or declared permanent failure of the non-data PLSS, PRO inputs the resolution into the Payload Anomaly Report per SOP 1.7.

8. ~~If failure is permanent or other procedures are changed permanently, POD notifies Payload Operations Manager (POM).~~

C. POIF-Operated Hardware Anomaly

NOTE: PSE and ~~EXPRESS Support~~ external supporting organizations (PEI, PSIV, CSE)will be called in as needed per SOP 1.18.

1. PRO/PSE leads further troubleshooting of hardware and submits a PAR per SOP 1.7. If resources are not currently scheduled for the troubleshooting, PRO/PSE submits an OCR for resources.

2. Once resources for troubleshooting are ~~currently~~ scheduled, PRO/PSE analyzes data and performs troubleshooting, as needed. PRO/PSE interacts with Users and ~~off-line personnel for support function~~external support organizations, as required.

3. PRO/PSE develops payload recovery plan and submits it to POD for approval.

4. If the payload recovery plan includes an IFM, PSE places the item on the Designated Maintenance Item (DMI) list per SOP 2.26 and assists in the development of the IFM procedure per SOP 2.11.

~~4.~~5. After POD approval of the payload recovery plan, PRO/PSE submits an OCR per SOP 1.6 for resources necessary for recovery.

~~5.~~6. When the OCR is approved, the cadre implements the payload recovery plan as defined in the OCR.

7. ~~6.~~ PRO notifies POD of the results of the recovery effort.

8. ~~7.~~ PAYCOM notifies crew of the results of the recovery effort.

9. ~~8.~~ If recovery is not successful, PRO/PSE can return to troubleshooting or declare permanent failure.

10. ~~9.~~ Upon successful recovery or declared permanent failure, PRO/PSE inputs the payload recovery into the PAR.

11. ~~10.~~ ~~If failure is permanent or other procedures are changed permanently, POD notifies OFD.~~

D. Payload and Non-POIF-Operated Facility Anomaly

~~JOIP NOTE: POD informs FD of payload anomalies.~~

1. PRO/Facility operator assists the User in troubleshooting the anomaly.

2. LIS Rep provides OC science priorities if needed.

3. User submits PAR per SOP 1.7.

4. If additional resources are required, User/Facility operator writes an OCR to request resources for troubleshooting.

5. The User/Facility operator and PRO determine the payload recovery plan.

6. If the payload recovery plan includes an IFM, PSE places the item on the DMI list per SOP 2.26 and assists in the development of the IFM procedure per SOP 2.11.

6.7. The User/Facility operator presents the anomaly resolution to the cadre on the POD loop.

7.8. After POD approval, the User/Facility operator writes an OCR to request resources for recovery plan.

8.9. After OCR approval, cadre/Users support the recovery plan and actions as defined on the OCR.

9.10. The User/Facility operator notifies POD of the results of the recovery effort.

10.11. PAYCOM notifies crew of the results of the recovery effort.

11.12. If recovery is not successful, User/Facility operator can return to troubleshooting or declare permanent failure.

12.13. Upon successful recovery or declared permanent failure, User/Facility operator inputs the resolution into the PAR.

13.14. If failure is permanent or other procedures are changed permanently, POD notifies OFD.

E. International Partner Payload Anomaly

JOIP NOTE: IP notifies POIC OC on OC loop of IP-specific anomalies including element systems and payload anomalies.

1. SCM assesses anomaly for impacts to ISS safety. OC assesses for operations impacts.

2. OC logs information on PAR per SOP 1.7.

3. If the anomaly investigation lead by the IP results in an approved IFM activity, PSE places the item on the DMI list per SOP 2.26 and assists in the development of the IFM procedure per SOP 2.11.

JOIP NOTE: IP is responsible for keeping OC informed of all developments.

4. OC keeps PAR updated until final resolution of anomaly.